STCE Newsletter

30 Jun 2025 - 6 Jul 2025

Published by the STCE - this issue : 11 Jul 2025. Available online at https://www.stce.be/newsletter/ .

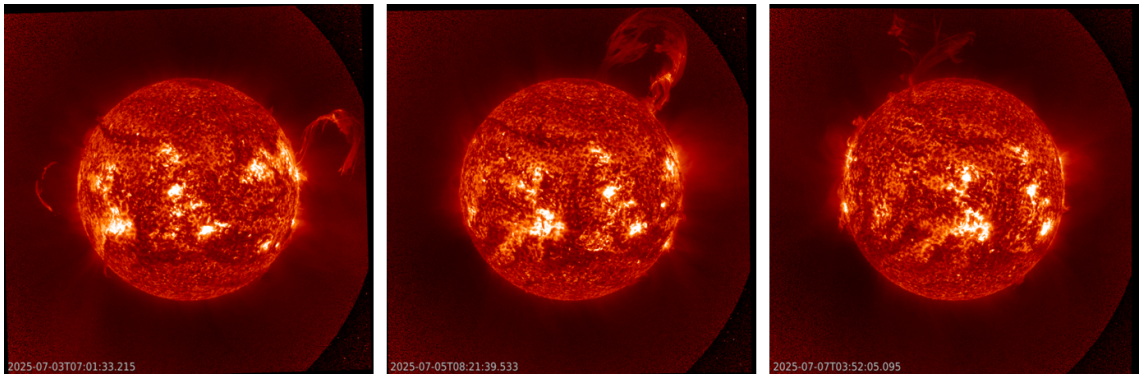
The Solar-Terrestrial Centre of Excellence (STCE) is a collaborative network of the Belgian Institute for Space Aeronomy, the Royal Observatory of Belgium and the Royal Meteorological Institute of Belgium.

Content	Page
1. Hurray for the prominence eruptions!	2
2. The SIDC Space Weather Briefing	3
3. International Sunspot Number by SILSO	4
4. PROBA2 Observations	4
5. Geomagnetic Observations in Belgium	5
6. Review of Ionospheric Activity	6
7. Review of Solar and Geomagnetic Activity	8
8. Upcoming Activities	9

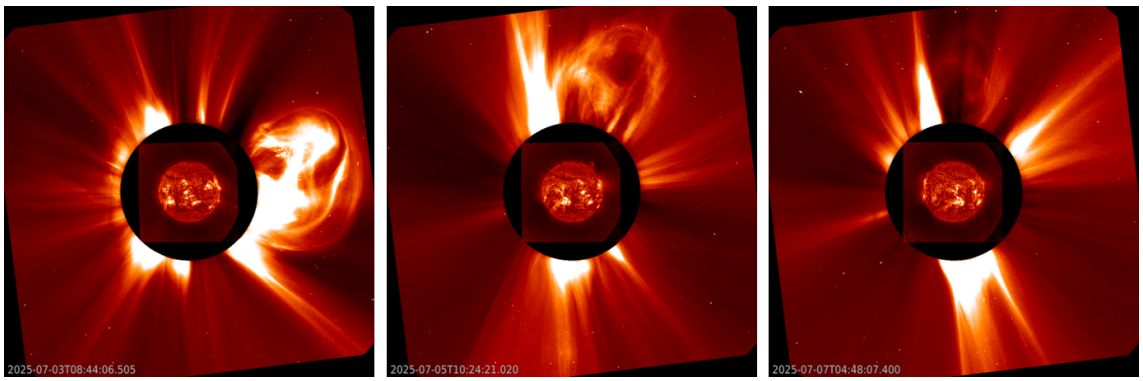
Final Editor : Petra Vanlommel
Contact : R. Van der Linden, General Coordinator STCE,
Ringlaan - 3 - Avenue Circulaire, 1180 Brussels,
Belgium

1. Hurray for the prominence eruptions!

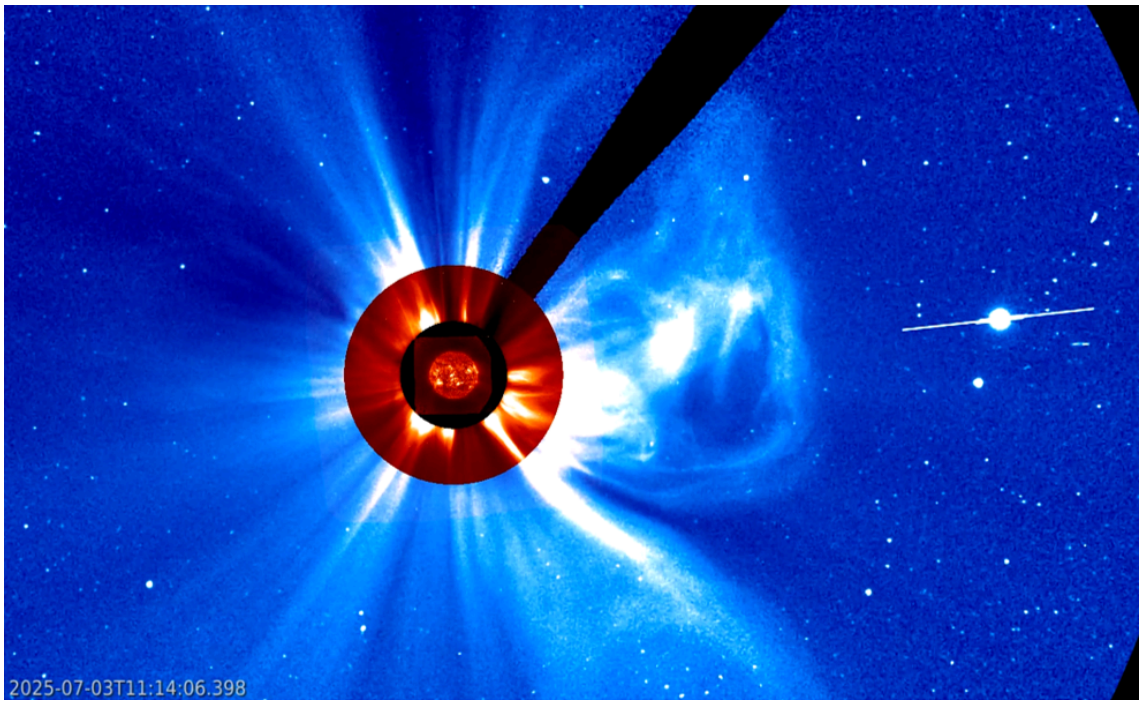
Last week was relatively quiet, with many, but small and simple sunspot groups. Fortunately, we can still count on the prominences and filaments for some action. Solar prominences are clouds of charged particles ("plasma") above the solar surface squeezed between magnetic regions of opposite magnetic polarity. Being cooler and denser than the plasma underneath and their surroundings, they appear as bright blobs when seen near the solar limb and as dark lines when seen on the solar disk (then they are called "filaments"). Special filters are required to observe these features, such as in the Hydrogen-alpha (H-alpha) line in the red part of the solar spectrum, or in some extreme ultraviolet (EUV) passbands.



Prominences and filaments can erupt when they reach a certain height or length, as their upholding magnetic fields may become unstable. Also nearby solar eruptions may destabilize these magnetic fields (see e.g. this STCE newsitem at https://www.stce.be/news/361/welcome.html for an example). In the EUV imagery (GOES/SUVI 304) above, prominence eruptions are shown on 3 and 5 July, and a filament eruption on 7 July. Clips are available in the online version of this article at https://www.stce.be/news/775/welcome.html



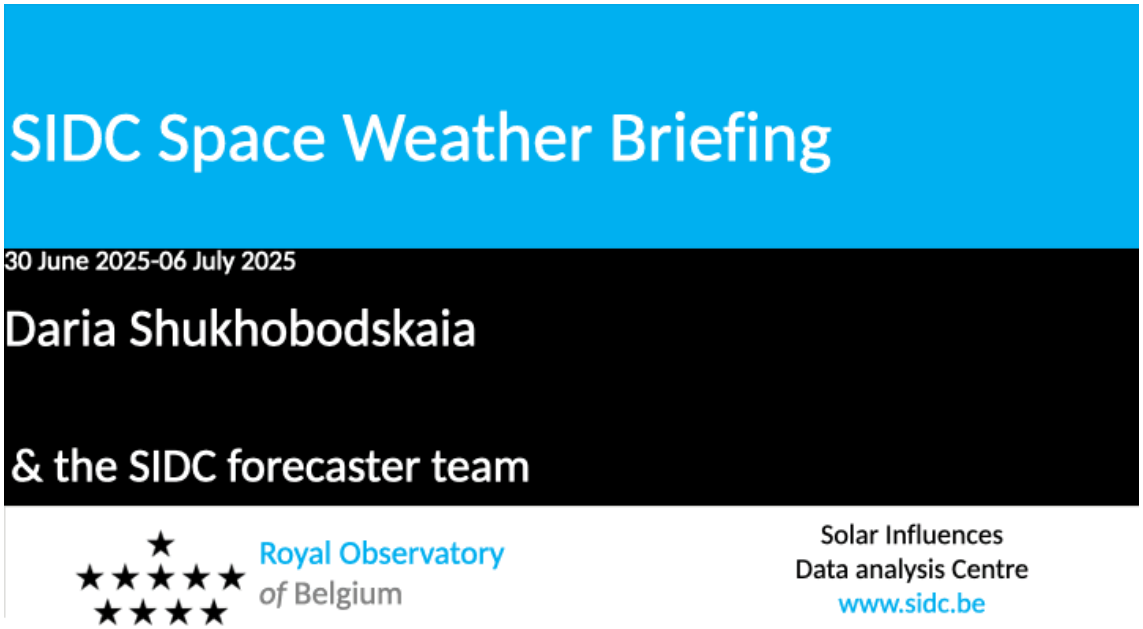
Such important eruptions are usually associated with a coronal mass ejection (CME), and this was the case for all three eruptions. They are shown in the images above combining SUVI 304 with white light coronagraphic images by SOHO/LASCO C2. All three CMEs have a plane-of-the-sky speed between 300 and 500 km/s, and are not directed to Earth. The imagery underneath adds the SOHO/LASCO C3 widefield for the 3 July event. The bright dot on the right is the planet Jupiter, the largest planet of our solar system. It is located five times as far from the Sun as the Earth and -as seen from Earth- on the opposite side of the Sun. It was in conjunction on 24 June.



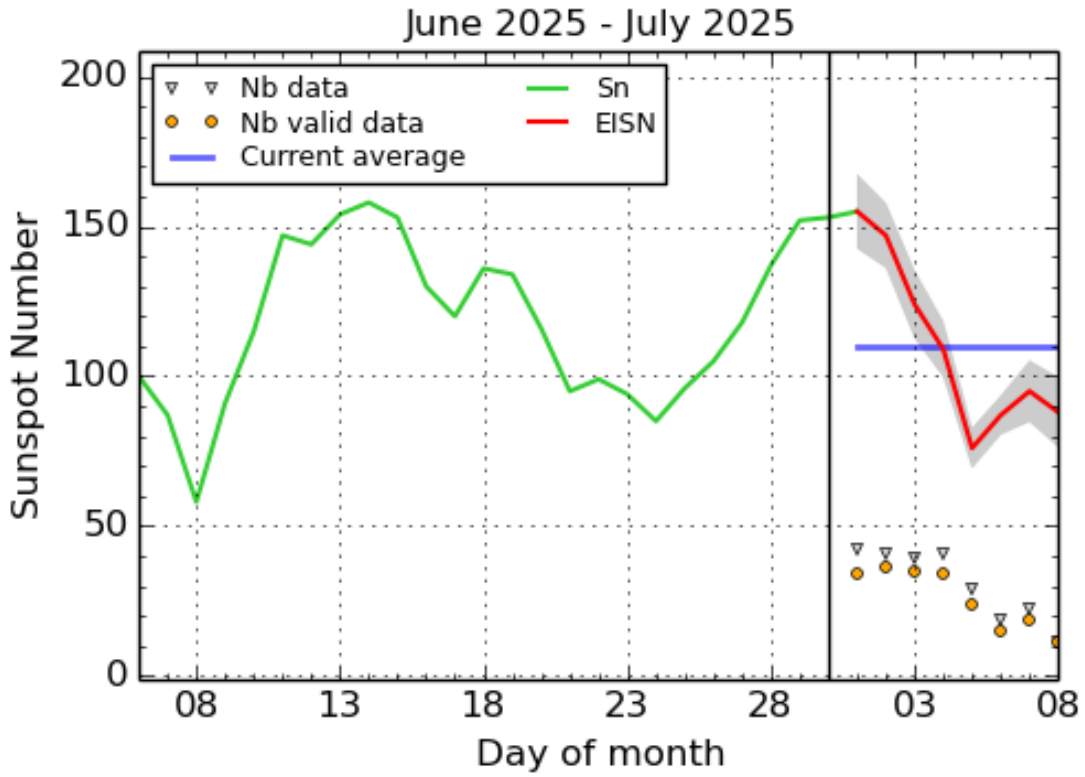
2. The SIDC Space Weather Briefing

The forecaster on duty presented the SIDC briefing that gives an overview of space weather from June 30 to July 7.

The pdf of the presentation can be found here: https://www.stce.be/briefings/20250707_SWbriefing.pdf



3. International Sunspot Number by SILSO



SILSO graphics (http://sidc.be/silso) Royal Observatory of Belgium, 2025 July 8

The daily Estimated International Sunspot Number (EISN, red curve with shaded error) derived by a simplified method from real-time data from the worldwide SILSO network. It extends the official Sunspot Number from the full processing of the preceding month (green line), a few days more than one solar rotation. The horizontal blue line shows the current monthly average. The yellow dots give the number of stations that provided valid data. Valid data are used to calculate the EISN. The triangle gives the number of stations providing data. When a triangle and a yellow dot coincide, it means that all the data is used to calculate the EISN of that day.

4. PROBA2 Observations

Solar Activity

Solar flare activity was low during the week.

In order to view the activity of this week in more detail, we suggest to go to the following website from which all the daily (normal and difference) movies can be accessed: https://proba2.oma.be/ssa

This page also lists the recorded flaring events.

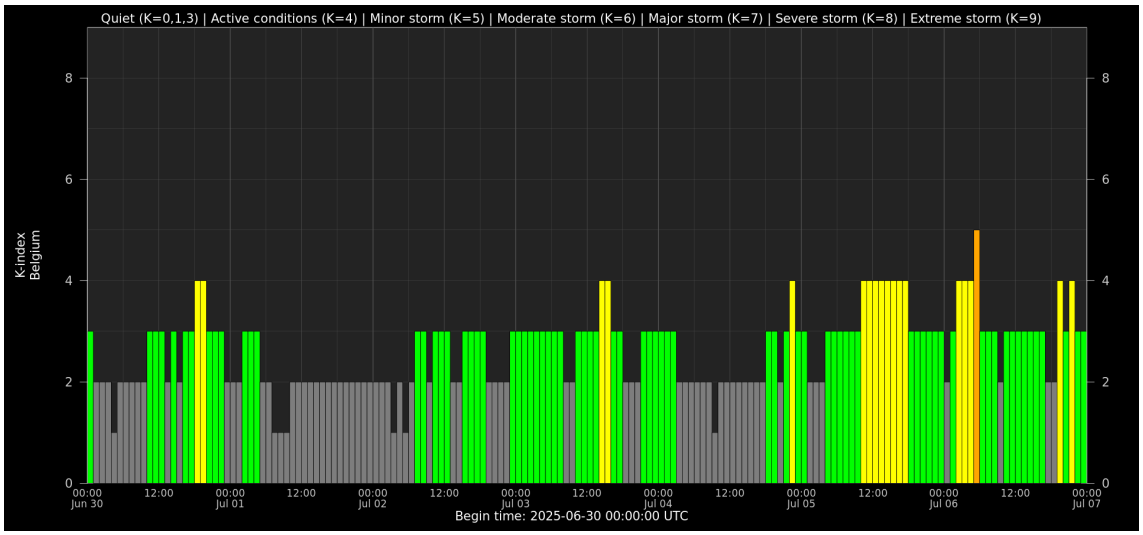
A weekly overview movie can be found here : https://proba2.sidc.be/swap/data/mpg/movies/weekly_movies/weekly_movie_2025_06_30.mp4 (SWAP week 797).

Details about some of this week's events can be found further below.

If any of the linked movies are unavailable they can be found in the P2SC movie repository here: https://proba2.sidc.be/swap/data/mpg/movies/

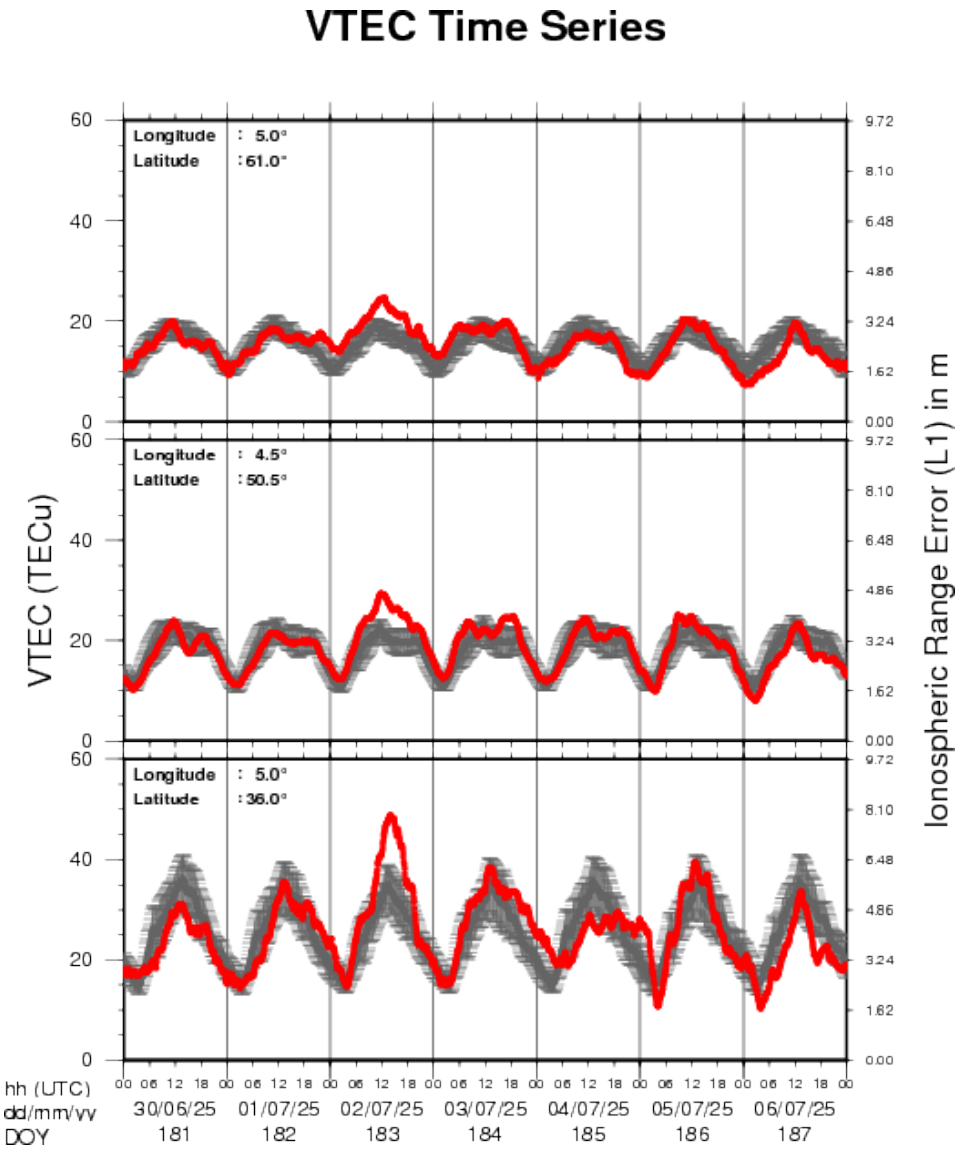
No special SWAP or LYRA images during this week.

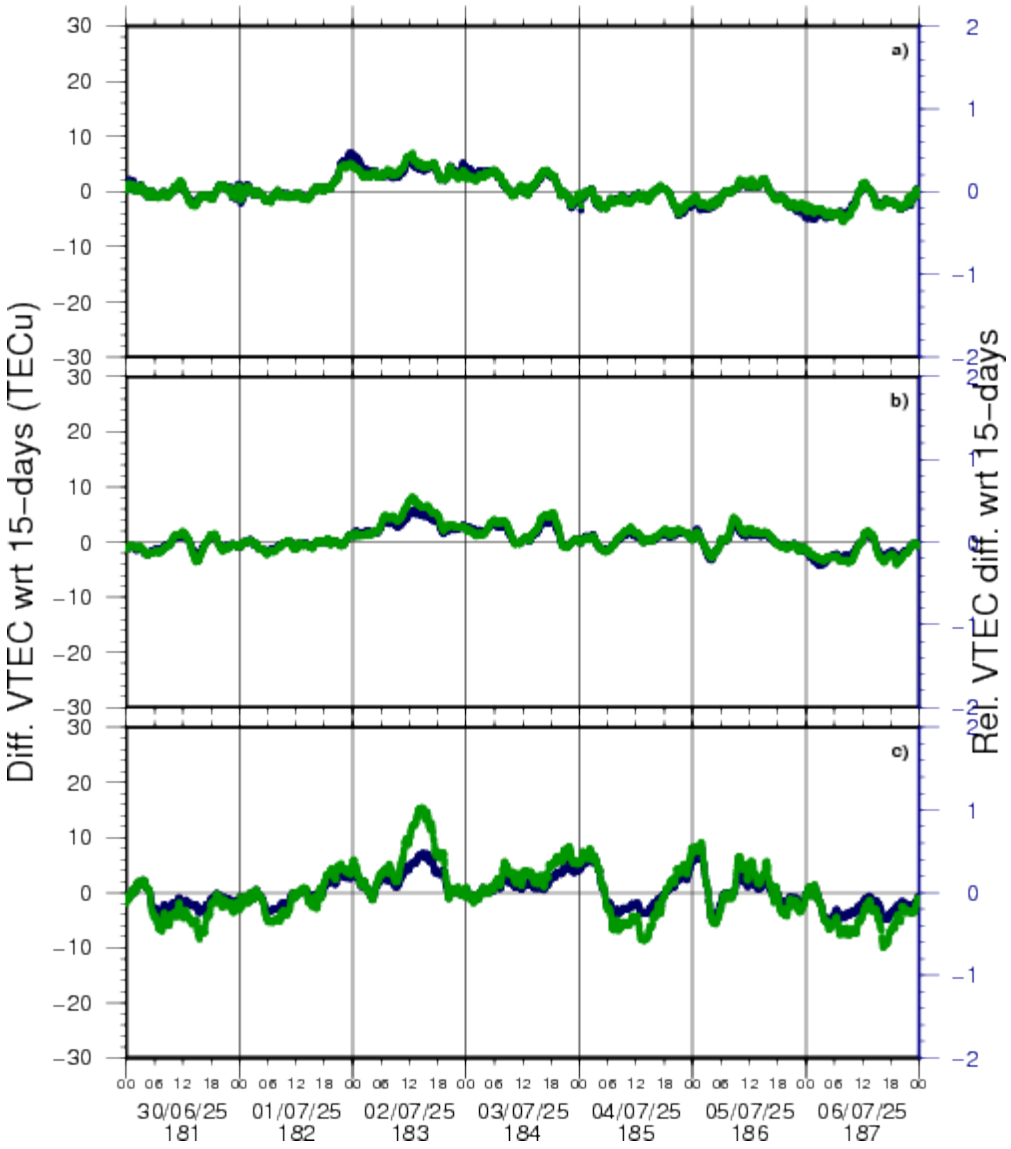
5. Geomagnetic Observations in Belgium



Local K-type magnetic activity index for Belgium based on data from Dourbes (DOU) and Manhay (MAB). Comparing the data from both measurement stations allows to reliably remove outliers from the magnetic data. At the same time the operational service availability is improved: whenever data from one observatory is not available, the single-station index obtained from the other can be used as a fallback system.
Both the two-station index and the single station indices are available here: http://ionosphere.meteo.be/geomagnetism/K_BEL/

6. Review of Ionospheric Activity





VTEC time series at 3 locations in Europe from 30 Jun 2025 till 6 Jul 2025

The top figure shows the time evolution of the Vertical Total Electron Content (VTEC) (in red) during the last week at three locations:
a) in the northern part of Europe(N 61deg E 5deg)
b) above Brussels(N 50.5deg, E 4.5 deg)
c) in the southern part of Europe(N 36 deg, E 5deg)
This top figure also shows (in grey) the normal ionospheric behaviour expected based on the median VTEC from the 15 previous days.

The time series below shows the VTEC difference (in green) and relative difference (in blue) with respect to the median of the last 15 days in the North, Mid (above Brussels) and South of Europe. It thus illustrates the VTEC deviation from normal quiet behaviour.

The VTEC is expressed in TECu (with TECu=10^16 electrons per square meter) and is directly related to the signal propagation delay due to the ionosphere (in figure: delay on GPS L1 frequency).

The Sun's radiation ionizes the Earth's upper atmosphere, the ionosphere, located from about 60km to 1000km above the Earth's surface.The ionization process in the ionosphere produces ions and free electrons. These electrons perturb the propagation of the GNSS (Global Navigation Satellite System) signals by inducing a so-called ionospheric delay.

See http://stce.be/newsletter/GNSS_final.pdf for some more explanations; for more information, see https://gnss.be/SpaceWeather

7. Review of Solar and Geomagnetic Activity

WEEK 1279 from 2025 Jun 30

Solar Active Regions and flares

Solar flaring activity was low throughout the week, with a total of 26 C-class flares recorded. A total of seventeen numbered active regions (ARs) were observed on the visible solar disc. The most active were SIDC Sunspot Group 543 (NOAA AR 4126; magnetic type beta) and SIDC Sunspot Group 513 (NOAA AR 4130; magnetic type beta). The largest flares of the week were two C2.5 flares: SIDC Flare 4796, peaking at 07:47 UTC on July 4, associated with SIDC Sunspot Group 543; and SIDC Flare 4787, peaking at 18:35 UTC on July 2, associated with SIDC Sunspot Group 537.

Coronal mass ejections

No Earth-directed coronal mass ejections (CMEs) were observed during the week. A wide coronal mass ejection (SIDC CME 525) was observed in SOHO/LASCO-C2 data at around 07:32 UTC on July 3, directed toward the west from Earth’s perspective. The CME was likely associated with a large filament eruption from the far side of the Sun. No impact on solar wind conditions near Earth was expected.

Coronal Holes

A mid-latitude, negative polarity coronal hole (SIDC Coronal Hole 111) crossed the central meridian over the course of the week, with the associated high-speed stream (HSS) likely influencing near-Earth solar wind conditions toward the end of the period.

Proton flux levels

The greater than 10 MeV GOES proton flux remained below the 10 pfu threshold for the entire week.

Electron fluxes at GEO

The greater than 2 MeV electron flux was mostly above the 1000 pfu threshold from June 29 until July 3, as measured by the GOES-18 and GOES-19 satellites. The 24-hour electron fluence was at moderate to high levels at the beginning of the week and decreased to normal levels toward the end of the period.

Solar wind

At the beginning of the week, solar wind parameters reflected the waning influence of high-speed streams (HSSs) from SIDC Coronal Hole 116 (negative polarity). The solar wind speed gradually decreased from about 550 km/s to 350 km/s. The interplanetary magnetic field remained below 6 nT, and its southward component fluctuated between -5 nT and 5 nT. From July 3, the solar wind became slightly disturbed due to the glancing blow arrival of an interplanetary coronal mass ejection (ICME), likely associated with the partial halo CME observed on June 28 (SIDC CME 523). The interplanetary magnetic field increased up to 14 nT, and the southward component reached a minimum of -12 nT. From July 5 onward, solar wind parameters remained slightly elevated due to the possible arrival of a high-speed stream (HSS) from the mid-latitude negative polarity coronal hole (SIDC Coronal Hole 111). The magnetic field reached values up to 13 nT, and the solar wind speed gradually increased to around 480 km/s by the end of the week.

Geomagnetism

At the beginning of the week, geomagnetic conditions were quiet to unsettled globally (NOAA Kp = 1 to 3) and locally over Belgium (K-Bel = 1 to 3). From July 3, geomagnetic activity increased due to the glancing blow arrival of an interplanetary coronal mass ejection (ICME) likely associated with the partial halo CME of June 28 (SIDC CME 523). Active conditions were observed globally (Kp = 4-) and locally (K-Bel = 4) between 12:00 and 15:00 UTC and again between 21:00 and 00:00 UTC on July 3. Geomagnetic conditions remained mostly unsettled over the following days, with isolated active intervals. On July 6, minor storm levels were reached globally (Kp = 5) and locally (K-Bel = 5) between 03:00 and 06:00 UTC, likely driven by the combined effects of a waning ICME and high-speed stream (HSS) from SIDC Coronal Hole 111.

8. Upcoming Activities

Courses, seminars, presentations and events with the Sun-Space-Earth system and Space Weather as the main theme. We provide occasions to get submerged in our world through educational, informative and instructive activities.

* Aug 25, Guest lecture De Zon, Zomerschool Sterrenkunde, Vereniging voor Sterrenkunde, Leuven, Belgium
* Sep 1, STCE seminar: Ground-Based Windows to the Sun: Solar Observations with the Dutch Open Telescope, Space Pole Uccle
* Sep 8-10, STCE course: Role of the ionosphere and space weather in military communications, Brussels, Belgium - register: https://events.spacepole.be/event/226/
* Sep 20, Public Lecture "België op weg naar de zon met Proba-3!", UGhent Volkssterrenwacht Armand Pien, Gent, Belgium
* Oct 23-25, ESWW Space Weather Training by Umea University and STCE, Kiruna, Sweden, https://esww.eu/training/application
* Oct 27-31, European Space Weather Week, Umea, Sweden - https://esww.eu/
* Nov 17-19, STCE Space Weather Introductory Course, Brussels, Belgium - register: https://events.spacepole.be/event/217/

To register for a course and check the seminar details, navigate to the STCE Space Weather Education Center: https://www.stce.be/SWEC
If you want your event in the STCE newsletter, contact us: stce_coordination at stce.be

Website: https://www.stce.be/SWEC